

## DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN OR RELATING TO APPARATUS FOR  
TESTING THE ADHESION OF COATINGS

- (71) We, CENTRAL ELECTRICITY GENERATING BOARD, a British Body Corporate, of Sudbury House, 15, Newgate Street, London, E.C.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- 10 This invention relates to apparatus for testing the adhesion of surface coatings to substrates and of the kind in which a test member (known from its shape as a dolly and referred to hereinafter as a dolly) can be fixed to the coated surface using a suitable adhesive and, after the adhesive has hardened, the adhesion of the coating to the substrate is tested by pulling the dolly away from the test surface without applying any turning torque to it.
- 20 We have previously proposed that the dolly should be constructed with a stem having a neck of such predetermined cross-sectional area that it breaks under a pull which just exceeds the required adhesion of the coating to the surface. Thus if the dolly breaks, the adhesion of the coating is satisfactory. The coating would be deemed unsatisfactory if it was pulled off the substrate by the predetermined tensile load applied to the dolly.
- 30 According to the present invention apparatus for testing the adhesion of a surface coating to a substrate comprises a dolly for attachment to the coating with an adhesive, and means for pulling said dolly in a direction away from said surface, said means including a shear pin arranged to shear when the pull exceeds a predetermined value. With this construction, by selecting a suitable shear pin, a surface coating can be tested to ensure that the adhesion exceeds a predetermined value corresponding to the breaking value of the shear pin. Thus it is possible to use standard size dollies
- whatever coating is to be tested. If the shear pin breaks the coating adhesion exceeds the required value. The dolly remains attached to the surface. The stem of the dolly can be cut off and the remaining part used to apply an inspector's approval reference. If the dolly comes away with part of the coating, then the coating is not satisfactory. With this arrangement, there is no necessity to have specially machined dollies, such as have been envisaged heretofore, which would break under a predetermined pull.
- Conveniently the dolly comprises a disc-like member having a flat surface for securing an adhesive to the coating to be tested, the opposite surface of the disc preferably being domed and having a central stem formed integrally with the disc terminating in a head. The means for pulling the dolly away from the surface may comprise a tripod arranged to straddle the dolly and a member arranged for gripping the head, said member for gripping the head being non-rotatable with respect to the tripod but being carried on a threaded member by means of which a pull can be applied to the dolly. This arrangement forms in effect, a three-legged screw-jack which may be manually operable, for example using a knurled nut. The tripod preferably has adjustable legs so that it can be set to give a pull exactly aligned with the stem of the dolly.
- The member arranged for gripping the head may have a keyway in which the head of the dolly can be inserted. This member, in one construction, has an axial bore through which passes the threaded member to be aligned with the stem of the dolly, said shear pin passing through the members orthogonally to the axis thereof so that the pull on the dolly applies shear stress to the pin. The pin conveniently seats in a V-shaped bore in a hardened steel insert in

said member; such a V-shaped bore accepts any diameter of pin.

It will be seen that the construction constitutes a screw jack in which the pull is applied to the dolly through a shear pin. By selecting a shear pin of appropriate cross-sectional area, material or quality to have a predetermined breaking load, a coating can be tested for any specified adhesion value. If the surface coating meets the required adhesion value, the pin will shear and the dolly will remain adhered to the surface coating. If the surface coating does not meet the required adhesion value, the dolly flange will part from the base material taking all or part of the surface coating with it. The method of test is therefore non-destructive if the surface coating and its application is satisfactory.

The method of testing is applicable to all types of surface coatings.

The apparatus described above may be used as a standard for the calibration of other surface coating test instruments, once the particular surface coating's adhesion has been determined using this apparatus.

In the following description, reference is made to the accompanying drawings in which:—

Figure 1 is a side elevation of a dolly for use in testing the adhesion of a coating;

Figure 2 is a side elevation partly in section of an apparatus for applying a tensile pull to the dolly of Figure 1; and

Figures 3, 4 and 5 are side and end elevations and an underside plan respectively of a part of the apparatus of Figure 2.

Referring to Figure 1, the dolly which is to be secured by an adhesive to the coating to be tested, comprises a disc-like member 10 having a flat surface 11 for securing by an adhesive to the coating. The opposite surface 12 of the disc is domed and has a central stem 13 formed integrally with the disc and terminating in a head 14.

The apparatus for applying a tensile load to the dolly is illustrated in Figure 2 and has three adjustable legs evenly spaced around a central axis. In Figure 1 only two of the legs 20, 21 are seen. Each leg consists of a threaded rod 22 having, at its lower end, an integral reduced diameter portion 23 terminating in a head (not shown). A foot 24 fits over the head at the bottom of the leg and the top of the foot is spun over to retain the foot in position on the leg but permitting slight movement so that the foot 24 can take up proper alignment with the surface on which it rests. The legs are threaded into a main body portion 25, adjustment of the length of the leg being effected by screwing the threaded rod portions 22 of the legs in or out as required.

The dolly is held by an element 26 having a keyway 37 into which the head of the

dolly can be inserted. The element 26 is of generally cylindrical form and fits in a cylindrical bore in the body 25. This element 26 is shown in further detail in Figures 3, 4 and 5. It has a key 27 secured by screw 28, which fits in a keyway 29 in the bore of the body 25 to prevent rotation of the element 26. A hole extends diametrically through the element 26 to receive a shear pin 30 extending transversely through the element 26 and through a threaded rod 31. This rod 31 engages the threaded bore of a knurled knob 32 (Figure 2) which is rotatably mounted on top of the body 25 by means of a ball bearing 33. Rotation of the knob 32 draws the rod 31 upwardly and, via the shear pin 30, the upward pull is transmitted to the element 26 and hence to the dolly.

This construction thus constitutes a screw jack in which the pull is applied to the dolly through the shear pin. The shear pin 30 is selected to be of appropriate cross-sectional area, material and quality to have a predetermined breaking load. In use, the dolly is secured by an adhesive to the coating and is then drawn upwards by means of the apparatus shown in Figures 2 to 5. If the shear pin 30 breaks, this indicates that the adhesion of the coating to its substrate is satisfactory. In this case the dolly is cut off at the stem. The cut-off portion may be used to apply an Inspector's Approval Reference. If the adhesion of the coating for the substrate is not satisfactory, the dolly will pull away with part of the coating instead of the shear pin breaking.

In a modification of the construction of Figure 2, a hardened steel insert in the element 26 has a V-shaped bore extending transversely through the element 26 to receive the shear pin which thus extends diametrically through the element 26.

#### WHAT WE CLAIM IS:

1. Apparatus for testing the adhesion of a surface coating to a substrate comprising a dolly for attachment to the coating with an adhesive, and means for pulling said dolly in a direction away from said surface, said means including a shear pin arranged to shear when the pull exceeds a predetermined value.

2. Apparatus as claimed in claim 1 wherein said dolly comprises a disc-like member having a flat surface for securing by an adhesive to the coating to be tested and a central stem terminating in a head.

3. Apparatus as claimed in claim 2 wherein the central stem is integral with the disc and head.

4. Apparatus as claimed in any of the preceding claims wherein the means for pulling the dolly away from the surface comprise a tripod arranged to straddle the dolly and a member adapted to grip the

- head, said member adapted to grip the head being non-rotatable with respect to the tripod but being carried on a threaded member by means of which a pull can be applied to the dolly. 5
5. Apparatus as claimed in claim 4 wherein said member adapted to grip the head has a keyway in which the head of the dolly can be inserted.
- 10 6. Apparatus as claimed in either claim 4 or claim 5 wherein a manually rotatable nut is provided for applying a pull to said member adapted to grip the head.
- 15 7. Apparatus as claimed in any of claims 4 to 6 wherein said member adapted to grip the head has an axial bore through which passes said threaded member alignable with the stem of the dolly, said shear pin passing through said member orthogonally to the axis thereof so that the pull applied to the dolly applies shear stress to the pin. 20
8. Apparatus as claimed in claim 7, wherein said pin seats in a V-shaped bore in said member adapted to grip the head. 25
9. Apparatus as claimed in any of claims 4 to 8 wherein the tripod has adjustable legs.
10. Apparatus for testing the adhesion of a surface coating to a substrate substantially as described with reference to Figures 1 to 5 of the accompanying drawings. 30
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